# STAFF REPORT

# ON

# THE MODIFICATIONS TO BENEFICIAL USES AND WATER QUALITY OBJECTIVES NECESSARY FOR THE REGULATION OF AGRICULTURAL SUBSURFACE DRAINAGE DISCHARGES IN THE SAN JOAQUIN BASIN (5C)

MARCH 1988

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

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CENTRAL VALLEY REGION

SACRAMENTO, CALIFORNIA

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## INTRODUCTION

The State Water Resources Control Board (SWRCB) adopted Order No. 85-1 on 5 February 1985. That order, in part, required that a Technical Committee be formed to look into the regulation of agricultural drainage discharges in the San Joaquin Basin and that the Central Valley Regional Water Quality Control Board (Regional Board) adopt appropriate basin plan amendments and implement a program to regulate agricultural drainage flows in the San Joaquin Basin.

The Technical Committee was charged with the specific tasks of developing: 1) proposed water quality objectives for the San Joaquin River Basin; 2) proposed effluent limitations for agricultural drainage discharges in the basin; and 3) a proposal to regulate these discharges. The Technical Committee has completed its work and issued a report (SWRCB, 1987) that includes recommended water quality objectives and a recommended plan of implementation.

The Regional Board has initiated its effort to amend the San Joaquin Basin Plan (5C) and to regulate agricultural subsurface drainage discharges. This report is part of that effort and deals with those modifications in designated beneficial uses and water quality objectives needed as a basis for the regulatory program. A subsequent report will deal with policies and a plan of implementation.

This report will be circulated for comment and be the basis for a workshop to discuss beneficial uses and water quality objectives. After a second workshop on policies and the plan of implementation, the reports, comments on reports, and the results of the workshops will form the basis for proposed basin plan amendments.

### Background

Figure 1 presents a map of the hydrological features of the San Joaquin Basin. Most of the agricultural subsurface drainage developed on the west side of the basin comes from the Panoche Fan area in western Merced and Fresno Counties.

The quality and quantity of the San Joaquin River is strongly influenced by agricultural subsurface drainage discharges. The quality of the river between Mendota Dam and Sack Dam is controlled by the Mendota Pool. During the irrigation season water is released from Mendota Dam and it is diverted at Sack Dam for irrigation. There is little or no flow in the river between Sack Dam and the mouth of the Merced River except agricultural drainage during the irrigation season. The quality of the river from the mouth of Salt Slough and the mouth of Mud Slough (north) to the mouth of the Merced River is dominated by the discharges from Salt Slough and Mud Slough (north). From the mouth of the Merced River to Vernalis the quality of the river is improved by the dilutional flows of the east side tributaries. Table 1 summarizes data on the four main constituents of concern in agricultural subsurface drainage for the San Joaquin River, Salt Slough and Mud Slough (north). Additional information on the hydrology and quality of the river can be found in the Technical Committee Report (SWRCB, 1987).

FIGURE 1

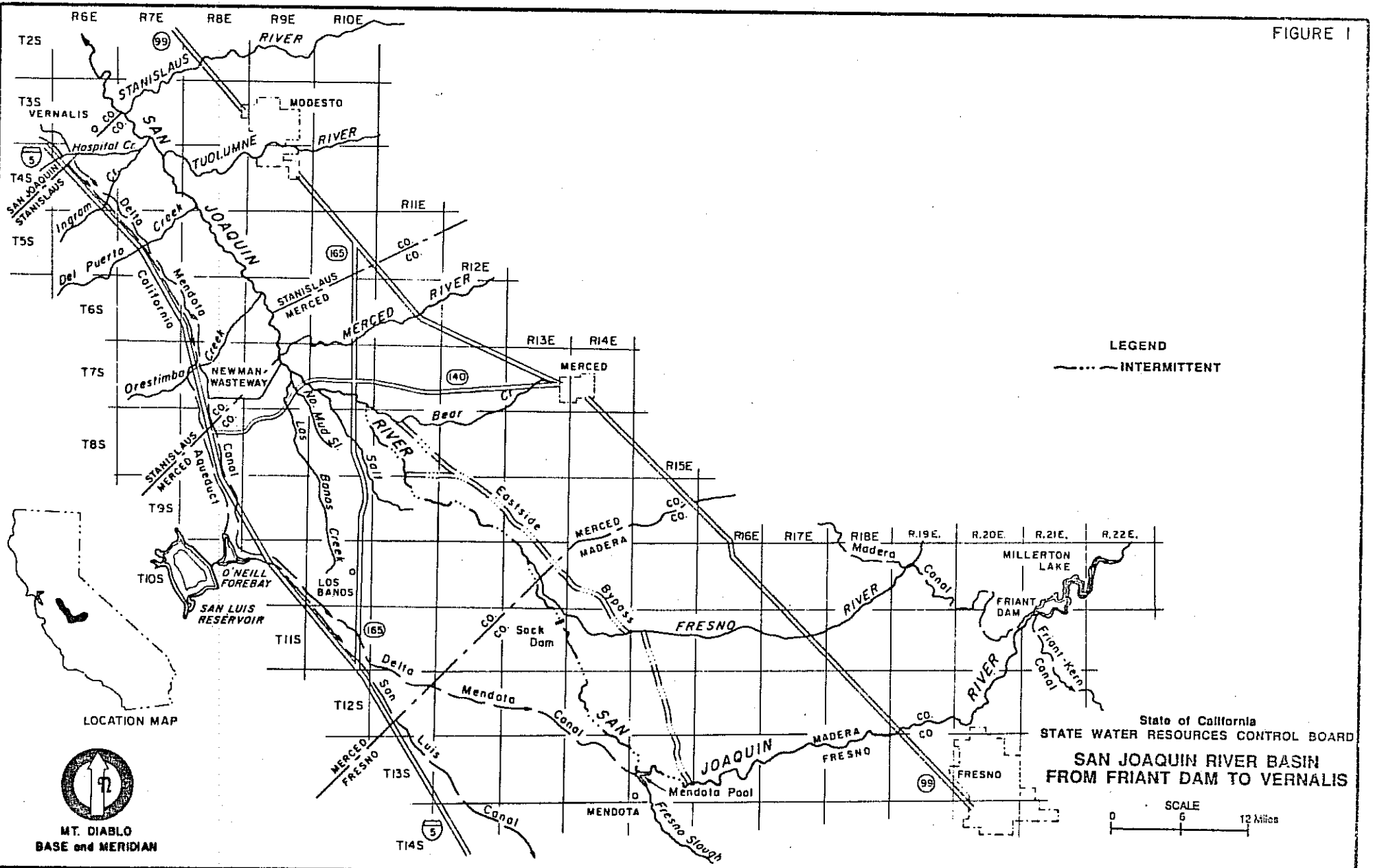
R6E
R7E
R8E
R9E
R10E
R11E
R12E
R13E
R14E
R15E
R16E
R17E
R18E
R19E.
R20E.
R21E.
R22E.
T2S
T3S
T4S
T5S
T6S
T7S
T8S
T9S
T10S
T11S
T12S
T13S
T14S
RIVER
STANISLAUS
TUOLUMNE
SAN JOAQUIN
VERNALIS
MODESTO
Hospital Cr.
Ingram Creek
Del Puerto Creek
California
Mendota
Orestimba Creek
NEWMAN-WASTEWAY
STANISLAUS MERCED
MERCED
Bear Cr.
No. Mud Sl.
Los Banos Creek
Salt
Eastside Bypass
MERCED MADERA
Madera Canal
MILLERTON LAKE
FRIANT DAM
Friant-Kern Canal
FRESNO
Sack Dam
Delta Mendota Canal
San Luis Canal
MERCED FRESNO
MADERA FRESNO
Mendota Pool
MENDOTA
Fresno Slough
O'NEILL FOREBAY
SAN LUIS RESERVOIR
LOS BANOS
STANISLAUS MERCED Aqueduct
Canal
99
5
140
165
CO.
LEGEND
INTERMITTENT
LOCATION MAP
MT. DIABLO
BASE and MERIDIAN
State of California
STATE WATER RESOURCES CONTROL BOARD
SAN JOAQUIN RIVER BASIN
FROM FRIANT DAM TO VERNALIS
SCALE
0
6
12 Miles

TABLE 1
WATER QUALITY DATA SUMMARY[1/]

San Joaquin River at Crows Landing[2/]

| Constituent | Median | Maximum | Minimum |
|---|---|---|---|
| Selenium (ug/l) | 3.8 | 12 | <1 |
| Boron (mg/l) | 0.83 | 1.9 | 0.14 |
| Molybdenum (ug/l) | 4 | 14 | 4 |
| Specific Conductance (umhos/cm) | 1250 | 2000 | 100 |

Mud Slough (north) at Highway 140

| Constituent | Median | Maximum | Minimum |
|---|---|---|---|
| Selenium (ug/l) | 8.0 | 32 | <1 |
| Boron (mg/l) | 3.0 | 8.2 | 0.65 |
| Molybdenum (ug/l) | 10 | 32 | 1.0 |
| Specific Conductance (umhos/cm) | 2500 | 8220 | 740 |

Salt Slough at Highway 165

| Constituent | Median | Maximum | Minimum |
|---|---|---|---|
| Selenium (ug/l) | 8.0 | 32 | <1 |
| Boron (mg/l) | 1.5 | 3.9 | 0.40 |
| Molybdenum (ug/l) | 8.0 | 30 | 1.0 |
| Specific Conductance (umhos/cm) | 1700 | 3700 | 570 |

1/Period of record: January 1985 to January 1988
2/Crows Landing is approximately 7 miles downstream of the mouth of the Merced River

## BENEFICIAL USES

Beneficial uses are the basis for the regulation of water quality. They formally recognize uses to be protected by regulatory activities. Basin plans, also known as water quality control plans, identify existing and potential beneficial uses for water bodies. Water bodies are river segments, lakes, reservoirs, etc. The basin plan breaks the surface water system of a basin into surface water bodies and identifies existing and potential beneficial uses for each water body. Not all surface water features are identified as water bodies. Small creeks, streams and sloughs may not be so identified. Rather, the basin plans assume they have the beneficial uses of the water body to which they are tributary.

Surface Water Bodies

The San Joaquin River Basin Plan (5C) divides the river system in the basin into 28 surface water bodies for the purpose of establishing beneficial uses. This effort focuses on a limited number of these water bodies in providing the necessary basis for the regulation of agricultural subsurface drainage discharges. The principal parts of the basin river system receiving, conveying or impacted by agricultural subsurface drainage are the San Joaquin River from approximately Lander Avenue to Vernalis and its west side tributaries. The existing surface water bodies identified in the Basin Plan in this reach are:

1. The San Joaquin River, Sack Dam to the mouth of the Merced River.

2. The San Joaquin River, mouth of the Merced River to Vernalis.

There are two west side tributaries, unidentified in the Basin Plan, that are important to the regulation of agricultural subsurface drainage discharges, and that are proposed to be identified as separate water bodies from the San Joaquin River. Salt Slough and Mud Slough (north) are both tributary to the San Joaquin River between Sack Dam and the mouth of the Merced River. They are the major drainage channels for agricultural subsurface drainage from the Panoche Fan area. As indicated in the Technical Committee Report (SWRCB, 1987), these two tributaries contribute the major part of the subsurface drainage pollutant load to the San Joaquin River.

Figure 2 locates Salt Slough and Mud Slough (north). Mud Slough (north) originates at Kesterson Ditch[1/] and flows generally north to the San Joaquin River. Mud Slough (north) enters the San Joaquin River approximately midway between the mouth of the Merced River and Highway 140 bridge[2/]. It is fed by a variety of sources including drainage from duck clubs and wildlife refuges, subsurface drainage and tailwater from upslope agriculture, irrigation canal spill water and runoff during the rainy season. The major inflows to Mud Slough (north) are Fremont Canal, Santa Fe Canal, Eagle Ditch and Los Banos Creek.

Salt Slough originates where Salt Slough Ditch and West Delta Drain meet and discharge through Sand Dam[3/]. Salt Slough flows first northwest and then north to the San Joaquin River. It enters the San Joaquin River about four miles upstream of where Mud Slough (north) enters[4/]. Salt Slough is fed by a variety of sources including both agricultural tailwater and subsurface drainage, irrigation canal spill water, drainage from duck clubs and wildlife refuges, and runoff during the rainy season. The major tributaries to Salt Slough are Salt Slough Ditch, the Boundary Drain and San Luis Canal via Mud Slough (south).

[1/]At SW 1/4, NW 1/4, NE 1/4, Sec. 33, T.8S, R.10E, MDB&M

[2/]At NW 1/4, NE 1/4, NW 1/4, Sec. 14, T.7S, R.9E, MDB&M

[3/]At SE 1/4, SE 1/4, NE 1/4, Sec. 21, T.9S, R.11E, MDB&M

[4/]At NE 1/4, NE 1/4, SW 1/4, Sec. 29, T.7S, R.10E, MDB&M

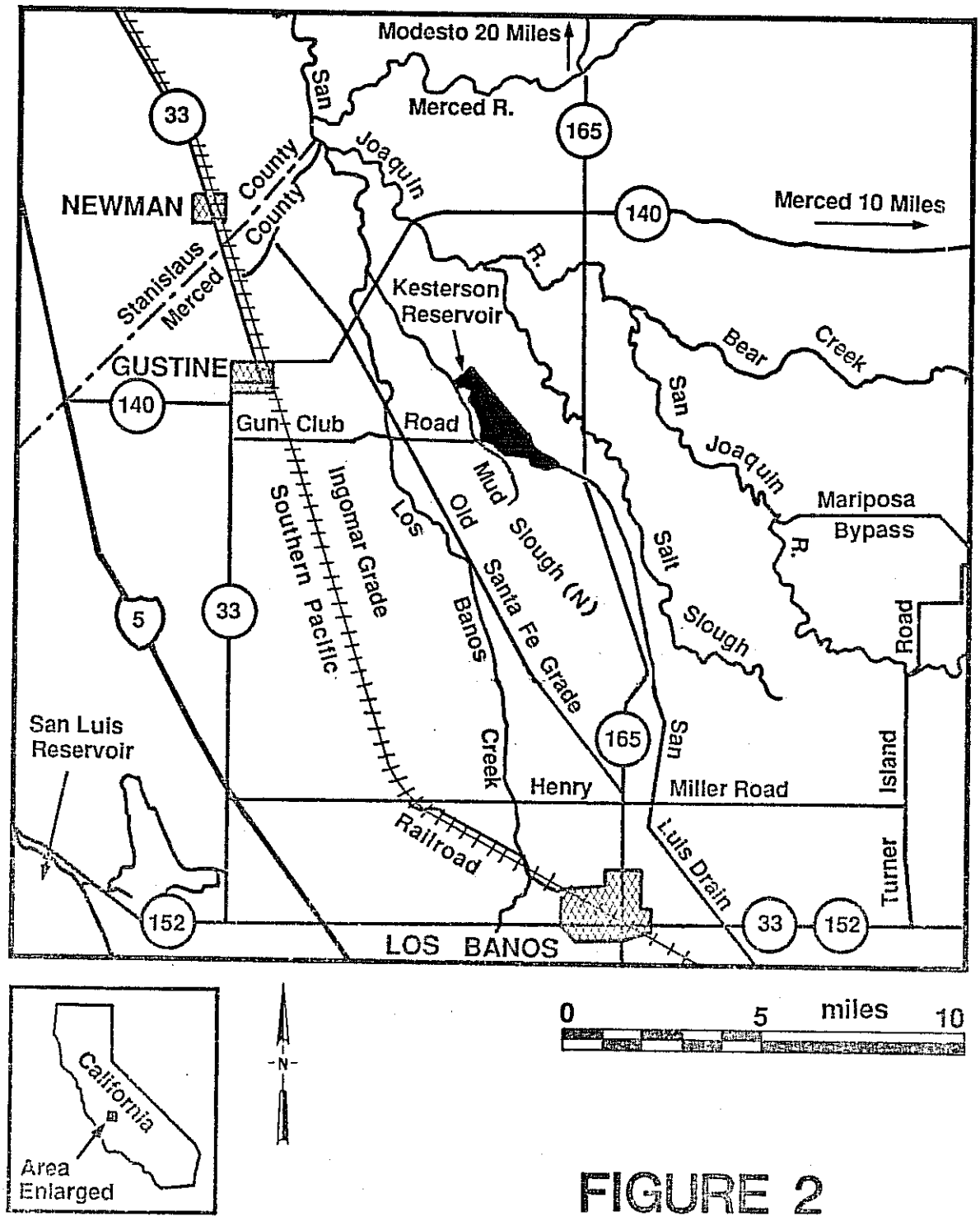
Modesto 20 Miles
San Joaquin
Merced R.
33
165
NEWMAN
Stanislaus County
Merced County
140
Merced 10 Miles
R.
Kesterson Reservoir
Bear Creek
GUSTINE
140
Gun Club Road
San Joaquin R.
Mariposa Bypass
Mud Slough (N)
Old Santa Fe Grade
Los Banos Creek
Ingomar Grade
Southern Pacific
Salt Slough
5
33
Road
San Luis Reservoir
165
San Luis Island
Henry
Miller Road
Railroad
Turner
Luis Drain
152
33
152
LOS BANOS
California
Area Enlarged
N
0
5
miles
10

FIGURE 2

As noted earlier, the basin plans assume unidentified tributaries have the beneficial uses of the stream to which they are tributary. For the tributaries of Mud Slough (north) and Salt Slough this is not accurate. Many of the tributaries of Mud Slough (north) and Salt Slough are agricultural drainage channels that do not nor could not support many of the beneficial uses proposed for Mud Slough (north) and Salt Slough. These tributaries are man-made or man-altered and maintained drainage ditches. Along with identifying Mud Slough (north) and Salt Slough as separate water bodies, it is proposed that it be noted that their tributaries do not necessarily have the same beneficial uses as they do.

Basin Plan Beneficial Uses

The Basin Plan identifies the existing and potential beneficial uses of surface waters. The standard beneficial uses defined in the Basin Plans are presented in Table 2. The standard beneficial uses identified in the Basin Plan for the two surface water bodies of concern here are presented in Table 3.

Proposed Changes

The purpose of this effort is the regulation of agricultural subsurface drainage discharges in the San Joaquin Basin (5C). The changes in beneficial uses proposed herein are limited to what is necessary to achieve that objective. The Technical Committee Report (SWRCB, 1987) recommends changes to beneficial uses basin wide and for beneficial uses not directly related to the above objective. Some of the recommended changes also need additional study. Recommended changes not considered here will be considered under the Regional Board's continuing program of basin plan review and update.

The modifications proposed herein to the identified beneficial uses in the San Joaquin Basin (5C) include the addition of two water bodies and one change to the designated beneficial uses for the San Joaquin River. The recommended modifications are summarized in Table 4 and discussed below.

Proposed Beneficial Use Changes - San Joaquin River

Only one minor change in designated beneficial uses is proposed here.

Spawning The San Joaquin Basin Plan identifies cold water spawning as a potential beneficial use for the San Joaquin River, Sack Dam to the mouth of the Merced River. The Technical Committee Report (SWRCB, 1987) recommends that this potential beneficial use be deleted, on the basis that it has never been confirmed. This reach of the San Joaquin River is a warm water aquatic environment on the floor of the valley. Additionally, except during periods of very high flow, most of the flow of the river is diverted before reaching this area. The designation of potential cold water spawning from this water body should be deleted.

TABLE 2 DEFINITION OF STANDARD BENEFICIAL USES

| Designation | Abbreviation | Definition |
|---|---|---|
| Municipal and Domestic Supply | MUN | Includes usual uses in community or military water systems and domestic uses from individual water supply systems. |
| Agricultural Supply | AGR | Includes crop, orchard, and pasture irrigation, stock watering, support of vegetation for range grazing, and all uses in support of farming and ranching operations. |
| Industrial Service Supply | IND | Includes uses which do not depend primarily on water quality such as mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, and oil well re-pressurization. |
| Industrial Process Supply | PROC | Includes process water supply and all uses related to the manufacturing of products. |
| Groundwater Recharge | GWR | Includes natural or artificial recharge for future extraction for beneficial uses and to maintain salt balance or halt saltwater intrusion into freshwater aquifers. |
| Freshwater Replenishment | FRSH | Provides a source of freshwater for replenishment of inland lakes and streams of varying salinities. |
| Navigation | NAV | Includes commercial and naval shipping. |
| Hydroelectric Power Generation | POW | Is that supply used for hydropower generation. |
| Water-Contact Recreation | REC 1 | Includes all recreational uses involving actual body contact with water, such as swimming, wading, waterskiing, skindiving, surfing, sport fishing, uses in therapeutic spas, and other uses where ingestion of water is reasonably possible. |
| Nonwater-Contact Recreation | REC 2 | Covers recreational uses which involve the presence of water but do not require contact with water, such as picnicking, sunbathing, hiking, beachcombing, camping, pleasure boating, tidepool and marine life study, hunting, and aesthetic enjoyment in conjunction with the above activities as well as sightseeing. |
| Warm Freshwater Habitat | WARM | Provides a warmwater habitat to sustain aquatic resources associated with a warmwater environment. |
| Cold Freshwater Habitat | COLD | Provides a coldwater habitat to sustain aquatic resources associated with a coldwater environment. |
| Wildlife Habitat | WILD | Provides a water supply and vegetative habitat for the maintenance of wildlife. |
| Preservation of Rare and Endangered Species | RARE | Provides an aquatic habitat necessary, at least in part, for the survival of certain species established as being rare and endangered species. |
| Fish Migration | MIGR | Provides a migration route and temporary aquatic environment for anadromous or other fish species. |
| Fish Spawning | SPWN | Provides a high-quality aquatic habitat especially suitable for fish spawning. |

Table 3 Basin Plan Beneficial Uses

| Surface Water Bodies | MUN | AGRI CULTURE | | INDUSTRY | | | RECREATION | | | FRESHWATER HABITAT | | MIGRATION | | SPAWNING | | WILD | NAV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AGR | | PROC | IND | POW | REC 1 | | REC 2 | WARM | COLD | MIGR | | SPWN | | | |
| | MUNICIPAL AND DOMESTIC SUPPLY | IRRIGATION | STOCK WATERING | PROCESS | SERVICE SUPPLY | POWER | CONTACT | CANOEING AND RAFTING | OTHER NONCONTACT | WARM | COLD | WARM | COLD | WARM | COLD | WILDLIFE HABITAT | NAVIGATION |
| SAN JOAQUIN RIVER | | | | | | | | | | | | | | | | | |
| SACK DAM TO MOUTH OF THE MERCED RIVER | ○ | ● | ● | ● | | | ● | ● | ● | ● | | ● | ● | ● | ○ | ● | |
| MOUTH OF THE MERCED RIVER TO VERNALIS | ○ | ● | ● | ● | | | ● | ● | ● | ● | | ● | ● | ● | | ● | |

Notes: ● Existing beneficial use

○ Potential beneficial use

Table 4 Proposed Beneficial Uses

| Surface Water Bodies | MUN | AGRI CULTURE | | INDUSTRY | | | RECREATION | | | FRESHWATER HABITAT | | MIGRATION | | SPAWNING | | WILD | NAV |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AGR | | PROC | IND | POW | REC 1 | | REC 2 | WARM | COLD | MIGR | | SPWN | | | |
| | MUNICIPAL AND DOMESTIC SUPPLY | IRRIGATION | STOCK WATERING | PROCESS | SERVICE SUPPLY | POWER | CONTACT | CANOEING AND RAFTING | OTHER NONCONTACT | WARM | COLD | WARM | COLD | WARM | COLD | WILDLIFE HABITAT | NAVIGATION |
| SAN JOAQUIN RIVER | | | | | | | | | | | | | | | | | |
| SACK DAM TO MOUTH OF THE MERCED RIVER | ○ | ● | ● | ● | | | ● | ● | ● | ● | | ● | ● | ● | ∅ | ● | |
| SALT SLOUGH | | ▲ | ▲ | | | | ▲ | ▲ | ▲ | ▲ | | ▲ | | ▲ | | ▲ | |
| MUD SLOUGH (NORTH) | | ▲ | ▲ | | | | ▲ | ▲ | ▲ | ▲ | | ▲ | | ▲ | | ▲ | |
| MOUTH OF THE MERCED RIVER TO VERNALIS | ○ | ● | ● | ● | | | ● | ● | ● | ● | | ● | ● | ● | | ● | |

Notes:
- ● Designated existing beneficial use
- ○ Designated potential beneficial use
- ▲ Proposed existing beneficial use
- ∅ Designated potential beneficial use proposed to be deleted

Proposed Beneficial Uses - Salt Slough and Mud Slough (north)

Salt Slough and Mud Slough (north) are similar, especially with respect to beneficial uses, and thus their proposed beneficial uses will be discussed together. Additionally, their proposed beneficial uses were influenced by and will be discussed in terms of the beneficial uses of the reach of the San Joaquin River to which they are tributary (i.e., the tributary reach).

Municipal and Domestic Supply The San Joaquin Basin Plan identifies this as a potential beneficial use of the tributary reach of the San Joaquin River; however no designation is proposed for Salt Slough or Mud Slough (north). This has never been an active beneficial use of either Salt Slough or Mud Slough (north). The nearest town, Gustine, is five miles away and uses wells for their water supply. Additionally, the salinities of both sloughs exceed both federal and state standards for drinking water, and water from either would not be considered an esthetically acceptable drinking water supply. The land use around both sloughs is agricultural, wildlife refuge and private duck clubs, and their drinking water and domestic supply comes from wells.

Agricultural Supply The Basin Plan identifies both irrigation and stock watering as beneficial uses of the tributary reach of the San Joaquin River. Both Salt Slough and Mud Slough (north) are used for pasture irrigation and stock watering. Mud Slough (north) is used for limited crop irrigation. Prior to 1985 both Salt Slough and Mud Slough (north) were used to irrigate summer pasture located in duck clubs. Both Agricultural Supply beneficial uses are proposed for Salt Slough and Mud Slough (north).

Industrial Supply The only industrial supply beneficial use identified for any of the reaches of the San Joaquin River considered herein is process. As with municipal and domestic supply, this has never been an existing beneficial use of either slough. There is no industry or industrial sites located along either slough. Lastly, the poor quality of the water in the sloughs would limit the possible industrial uses. No industrial supply beneficial uses are proposed for either Salt Slough or Mud Slough (north).

Recreation The San Joaquin Basin Plan identifies all three types of recreation beneficial uses for the tributary reach of the San Joaquin River. All three types of recreational beneficial uses are proposed for both Mud Slough (north) and Salt Slough. Fishing occurs along both Salt Slough and Mud Slough (north). Boating is limited along the sloughs. Because of a lack of public access and its shallow nature, there is no boating in Mud Slough (north). The upper reach of Salt Slough is similar to Mud Slough (north); the lower reach from Lander Avenue to the San Joaquin River does have some boating. However, recent case law requires the Department of Fish and Game to protect both sloughs for boating. The boating beneficial use should be applied to both sloughs to be consistent. There is no swimming in either slough. There are no public access areas with accomodations for swimmers or bathing along either slough. The water is poor for swimming. However, there are local residents who wade in both sloughs while scavenging for frogs and clams. This activity does represent contact recreation.

Freshwater Habitat The San Joaquin Basin Plan identifies the San Joaquin River from Mendota Pool to Vernalis as having the beneficial use WARM freshwater habitat, but does not identify it as having COLD freshwater habitat. Salt Slough and Mud Slough (north) both should be considered WARM freshwater habitat, because of the presence of warm water fish species. Likewise because of the absence of resident cold water species, they should not be considered COLD freshwater habitat. The beneficial use WARM freshwater habitat is proposed for both sloughs.

Fish Migration The Basin Plan identifies the San Joaquin River from Mendota Dam to Vernalis as both warm and cold water migration. The Technical Committee Report (SWRCB, 1987) recommends that the cold water migration beneficial use for the San Joaquin River between Mendota Dam and the Sack Dam be changed to a potential beneficial use or deleted. The migration beneficial use is based upon use of a water body by cold or warm water anadromous fish as a migration route and temporary habitat.

Warm water anadromous species (striped bass) use both sloughs as a migration route. The warm water migration beneficial use is proposed for both sloughs.

Cold water anadromous species (salmon) also try to migrate through both sloughs. Both sloughs and their tributaries are warm water aquatic habitat. They are often quite turbid with predominantly muddy bottoms. There is essentially no access to cold water habitat up these sloughs. While the use of these sloughs by warm water species could lead to habitat suitable for their survival and/or spawning, such is not the case with cold water species. The use of these sloughs by cold water anadromous species as a migration route is abberational and is likely due in large part to the presence of Delta water from upslope irrigated agriculture. A better approach to protecting the cold water fish resource would be to reduce the attractiveness of these sloughs to cold water species or to physically remove them to cold water streams or hatcheries, when they appear. The cold water migration beneficial use is not proposed for either slough.

Fish Spawning The San Joaquin Basin Plan identifies the San Joaquin River from the Mendota Dam to Vernalis as having the beneficial use warm water spawning. While the San Joaquin Basin Plan also identifies the San Joaquin River from Mendota Dam to the mouth of the Merced River as having the potential beneficial use of cold water spawning, the Technical Committee Report (SWRCB, 1987) recommends deletion of these potential beneficial uses. The beneficial use warm water spawning is proposed for both Salt Slough and Mud Slough (north), however cold water spawning is not. The beneficial use cold water spawning is not proposed because of the lack of conditions necessary to support cold water fish spawning.

Wildlife Habitat The San Joaquin Basin Plan identifies the San Joaquin River from Mendota Dam to Vernalis as having the beneficial use wildlife habitat. The beneficial use wildlife habitat is proposed for both Salt Slough and Mud slough (north). Both sloughs provide varying extent of riparian habitat. Additionally, both were used as water supplies for wildlife refuges prior to 1985.

Navigation None of the reaches of the San Joaquin River in the San Joaquin Basin is identified in the San Joaquin Basin Plan as having the navigation beneficial use. Similarly the beneficial use is not proposed for either Salt Slough or Mud Slough (north).

## WATER QUALITY OBJECTIVES

Water quality objectives are established in basin plans by the Regional Board to reasonably protect beneficial uses. Water quality objectives provide a specific basis for the measurement and maintenance of water quality. The factors considered in establishing water quality objectives include:

1. existing and potential beneficial uses;

2. environmental characteristics of the area including existing water quality;

3. achievability; and

4. economic considerations.

The San Joaquin Basin Plan (5C) contains water quality objectives for the surface water bodies of concern to this effort. However, few are specific to the control of the major constituents of concern in agricultural subsurface drainage. Additional water quality objectives are needed as a basis for the regulation of agricultural subsurface drainage discharges.

### Existing Water Quality Objectives

Table 5 presents the existing water quality objectives applicable to the San Joaquin River between Mendota Dam and Vernalis.

In addition to the specific objectives summarized in Table 5, there is a general objective applicable to the San Joaquin River. State Water Resources Control Board Resolution No. 68-16 "Statement of Policy with Respect to Maintaining High Quality of Waters in California" requires the continuing maintenance of existing water quality. The policy also provides conditions under which a change in water quality is allowable. A change must:

- Be consistent with maximum benefit to the people of the state.

- Not unreasonably affect present and anticipated beneficial uses of water.

- Not result in water quality less than that prescribed in water quality control plans and policies.

### Proposed Water Quality Objectives

The principal constituents of concern in agricultural subsurface drainage are selenium, boron, molybdenum and salinity. The most sensitive beneficial uses to these constituents are aquatic life, wildlife and agricultural supply.

TABLE 5 WATER QUALITY OBJECTIVES

| Constituent | Objective |
|---|---|
| Bacteria (REC 1) | Concentrations of fecal coliform bacteria in the San Joaquin River, based on a minimum of five samples for any 30-day period, shall not exceed a geometric mean of 200 colonies per 100 ml, nor shall more than 10% of the total number of samples taken during any 30-day period exceed 400 colonies per 100 ml. |
| Biostimulatory Substances | The San Joaquin River shall not contain biostimulatory substances in concentrations that promote aquatic growth to the extent that such growth causes nuisance or adversely affects beneficial uses. |
| Chemical Constituents (MUN) | The San Joaquin River shall not contain concentrations of chemical constituents in excess of the limits specified in California Code of Regulations (CCR), Title 22*, and in no instance shall contain chemical constituents in concentrations that adversely affect any beneficial uses. To the extent of any conflict, the more stringent objective applies. |
| Color | The San Joaquin River shall be free of discoloration that causes nuisance or adversely affects beneficial uses. |
| Dissolved Oxygen | The monthly median of the daily mean dissolved-oxygen concentration in the San Joaquin River shall not fall below 85% of saturation in the main water mass and the 95 percentile concentration shall not fall below 75% saturation. Dissolved-oxygen concentrations shall not be reduced below the following minimum levels at any time:<br>°Reaches designated as warm-water habitat (WARM) 5.0 mg/l<br>°Reaches designated for warm- or cold-water spawning (SPWN) 7.0 mg/l |
| Floating Material | The San Joaquin River shall not contain floating material in amounts that cause nuisance or adversely affect beneficial uses. |
| Oil and Grease | The San Joaquin River shall not contain oils, greases, waxes, or other materials in concentrations that cause nuisance, result in a visible film or coating on the surface of the water or on objects in the water, or otherwise adversely affect beneficial uses. |
| pH | The pH shall not be depressed below 6.5 nor raised above 8.5. Changes in normal ambient pH levels shall not exceed 0.5 in reaches of the River designated as cold- or warm-water habitats (COLD or WARM). |
| Pesticides | No individual pesticide or combination of pesticides shall be present in the San Joaquin River in concentrations that adversely affect beneficial uses. There shall be no increase in pesticide concentrations found in bottom sediments or aquatic life that adversely affects beneficial uses.<br><br>Total identifiable chlorinated hydrocarbon pesticides shall not be present at concentrations detectable within the accuracy of analytical methods prescribed in Standard Methods for the Examination of Water and Wastewater, latest edition, or other equivalent methods approved by the Executive Officer of the Central Valley Regional Board.<br><br>The San Joaquin River reaches designated for use as domestic or municipal supply (MUN) shall not contain concentrations of pesticides in excess of the limiting concentrations set forth in CCR, Title 22*. |

*Cited as "California Administrative Code, Title 17, Chapter 5, Subchapter 1, Group 1, Article 4 Section 7019, Tables 2, 3, and 4" in the 1975 edition of the San Joaquin Basin Plan.

TABLE 5 WATER QUALITY OBJECTIVES (Continued)

| Constituent | Objective |
|---|---|
| Radioactivity | Radionuclides shall not be present in the San Joaquin River in concentrations that are deleterious to human, plant, animal or aquatic life or that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, or aquatic life.<br><br>Reaches designated for use as domestic or municipal supply (MUN) shall not contain concentrations of radionuclides in excess of the limits specified in CCR, Title 22*. |
| Salinity | In the San Joaquin River near Vernalis, the mean average TDS concentration shall not exceed 500 mg/l over any consecutive 30-day period. |
| Sediment | The suspended sediment load and suspended sediment discharge rate of the San Joaquin River shall not be altered in such a manner as to cause a nuisance or adversely affect beneficial uses. |
| Settleable Material | The San Joaquin River shall not contain substances in concentrations that result in the deposition of material that causes nuisance or adversely affects beneficial uses. |
| Suspended Material | The San Joaquin River shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses. |
| Tastes and Odors | The San Joaquin River shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to domestic or municipal water supplies or to fish flesh or other edible products of aquatic origin or that cause nuisance, or otherwise adversely affect beneficial uses. |
| Temperature | The natural receiving water temperature of the San Joaquin River water shall not be altered unless it can be demonstrated to the satisfaction of the Central Valley Water Quality Control Board that such alteration in temperature does not adversely affect beneficial uses. At no time or place shall the temperature of the San Joaquin River be increased more than 5°F above natural receiving water temperature. |
| Toxicity | The San Joaquin River shall be maintained free of toxic substances in concentrations that are toxic to or that produce detrimental physiological responses in human, plant, animal, or aquatic life. Compliance with this objective will be determined by use of indicator organisms, analyses of species deversity, population density, growth anomalies, bioassays of appropriate duration or other appropriate methods as specified by the Central Valley Regional Water Quality Control Board. The survival of aquatic life in the San Joaquin River subjected to a waste discharge or other controllable water quality factors, shall not be less than that for the same water body in areas unaffected by the waste discharge, or, when necessary, for other control water that is consistent with the requirements for "experimental water" as described in Standard Methods for the Examination of Water and Wastewater, latest edition. At minimum, compliance with this objective as stated in the previous sentence shall be evaluated with a 96-hour bioassay. |
| Turbidity | The San Joaquin River shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases in turbidity attributable to controllable water quality factors shall not exceed the following limits:<br><br>°Where natural turbidity is between 0 and 50 Jackson Turbidity Units (JTU), increases shall not exceed 20%.<br>°Where natural turbidity is between 50 and 100 JTU, increases shall not exceed 10 JTU.<br>°Where natural turbidity is greater than 100 JTU, increases shall not exceed 10%. |

*Cited as "California Administrative Code, Title 17, Chapter 5, Subchapter 1, Group 1, Article 4 Section 7019, Tables 2, 3, and 4" in the 1975 edition of the San Joaquin Basin Plan.

Agricultural subsurface drainage contains other trace elements; however, data indicate they are present in less toxic concentrations. This effort focuses on the four main constituents of concern. Efforts to control them and reduce their concentration in surface waters will likely lead to reductions in the other trace elements. If at a later date it becomes apparent that another constituent of agricultural subsurface drainage represents a major water quality problem, consideration will be given to proposing water quality objectives for it.

The Technical Committee Report (SWRCB, 1987) recommended water quality objectives for the four main constituents of concern in agricultural subsurface drainage. The Committee's recommended water quality objectives are presented in Table 6.

Proposed Water Quality Objectives for Selenium

San Joaquin River, Mouth of the Merced River to Vernalis The proposed selenium water quality objectives, and compliance date and point are as follows:

- 5 ug/l monthly mean.
- 26 ug/l maximum.
- Measured at Crows Landing.
- Based on weekly sampling.
- Compliance to be achieved by October 1991.

The proposed objectives are the same as the interim objectives recommended in the Technical Committee Report (SWRCB, 1987). They are proposed for reasons similar to those given in the Technical Committee Report (SWRCB, 1987):

1. The proposed objectives provide reasonable protection to beneficial uses based on present knowledge.

2. The objectives are reasonably economically and technically achievable by the compliance date.

3. There is evidence suggesting the level protective of waterfowl is lower; however, there are on-going efforts to provide site-specific information on levels protective of waterfowl and the present waterfowl uses of this reach of the river are limited.

4. The Regional Board is required to reconsider selenium objectives for this reach of the San Joaquin River in three years.

5. The proposed objectives are in general agreement with the fresh water aquatic life criteria promulgated by EPA (EPA, 1987).

TABLE 6

TECHNICAL COMMITTEE REPORT (SWRCB, 1987)
RECOMMENDED WATER QUALITY OBJECTIVES

| LOCATION | CONSTITUENT | MAXIMUM MEAN MONTHLY LEVEL | INSTANTANEOUS MAXIMUM | COMPLIANCE DATE |
|---|---|---|---|---|
| Interim Objectives | | | | |
| San Joaquin River at Hills Ferry and downstream | Selenium | 5 ppb | 26 ppb | October 1991 |
| Grassland WD, San Luis NWR and Los Banos SWA | Selenium | 2 ppb (can be provided via a substitute supply)1/ | | October 1989 |
| Long-term Objectives | | | | |
| San Joaquin River at Hills Ferry and downstream | Selenium | to be determined based on site-specific data | | To be determined |
| | EC | 1.0 mmho | | |
| | Boron | 700 ppb | 5800 ppb | |
| | Molybdenum | 10 ppb | 440 ppb | |
| Salt & Mud Sloughs & San Joaquin River Lander Ave. to Hills Ferry | Selenium | 10 ppb | 26 ppb | To be determined |
| Salt Slough and San Joaquin River Lander Ave. to Hills Ferry | EC | 3.0 mmho | | To be determined |
| | Boron | 2,000 ppb | 5,800 ppb | |
| | Molybdenum | 10 ppb | 440 ppb | |
| Grassland WD San Luis NWR and Los Banos SWA | Selenium | To be determined based on site-specific data (can be provided via a substitute supply)1/ | | To be determined |

1/ If a substitute supply of 2 ppb or lower is provided, the quantity of this supply should be in a volume equal to the lesser of either (1) the quantity of water (mid-1970s) diverted by these waterfowl areas or (2) the actual flow in the canals available to these areas.

Salt Slough, Mud Slough (north) and the San Joaquin River, Sack Dam to the Mouth of the Merced River The proposed selenium water quality objectives, and compliance dates and points are as follows:

- o 10 ug/l monthly mean.
- o 26 ug/l maximum.
- o Measured at Highway 165 on Salt Slough and Highway 140 on Mud Slough (north).
- o Based on weekly sampling.
- o Compliance to be achieved by October 1993.

The proposed objectives are the same as the long-term objectives recommended in the Technical Committee Report (SWRCB, 1987). They are proposed for reasons similar to those given in the Technical Committee Report (SWRCB, 1987):

1. The proposed objectives are reasonably economically and technically achievable by the compliance date. The proposed objectives will, in part, be achieved by those efforts necessary to achieve the selenium objective proposed for the San Joaquin River, mouth of the Merced River to Vernalis.

2. It is not certain what selenium level is protective of the aquatic life in the sloughs. Present data indicate that the proposed objectives may reasonably protect instream fishery resources and human consumers of fish. There is on-going work that will provide additional information on the impacts of present and future levels of selenium on instream aquatic resources.

3. Another more restrictive objective is proposed for waterfowl areas.

4. The Regional Board is required to reconsider selenium objectives for these water bodies in three years.

Grassland Water District, San Luis National Wildlife Refuge, and Los Banos State Wildlife Area These areas are not separately identified water bodies. Thus, the water quality in the channels around and through these areas is controlled by compliance with the objectives for Mud Slough (north) and Salt Slough. With regards to selenium, this situation is not reasonably protective of the waterfowl using these areas. A separate selenium water quality objective, and compliance date and point are proposed as follows:

- o 2 ug/l monthly mean.
- o Measured in water used by subject areas for waterfowl habitat.
- o Based on weekly sampling during the period when water is applied to waterfowl areas.
- o Compliance to be achieved by October 1989.

The proposed objective is the same as the interim objective recommended in the Technical Committee Report (SWRCB, 1987). It is proposed for reasons similar to these given in the Technical Committee Report (SWRCB, 1987):

1. Evidence suggests that the selenium level for protection of waterfowl habitat water supply is lower than 5 ug/l.

2. The subject areas are principally used as waterfowl habitat.

3. The proposed objective is protective of the beneficial use and the waterfowl resource in the Central Valley.

4. The proposed objective is specific to the water supply for waterfowl areas. It only applies to the channels around and through the subject areas when they are being used to supply water to waterfowl habitat. Otherwise the proposed objectives in Mud Slough (north) and Salt Slough control the water quality in these channels.

5. This objective can be achieved technically and economically. However, there are a variety of means by which it may be met. The technical and economic reasonableness of achieving it strongly depends upon the means chosen.

6. The Regional Board is required to reconsider selenium objectives for these areas in three years.

Proposed Water Quality Objectives for Boron

San Joaquin River, Mouth of the Merced River to Vernalis The proposed water quality objectives, and compliance date and point are as follows:

- 1.0 mg/l monthly mean.
- 5.8 mg/l maximum.
- Measured at Crows Landing.
- Based on weekly sampling.
- Compliance to be achieved by October 1991.

The monthly mean objective is higher than that recommended in the Technical Committee Report (SWRCB, 1987). However, the maximum objective is the same. The above objectives are proposed for the following reasons:

1. One of the beneficial uses impacted by boron is agricultural irrigation supply. While some crops may require levels lower than 1.0 mg/l to be fully protected, the crops on which water from this reach of the San Joaquin River is presently used appear to show no boron toxicity damage. Since the proposed objectives will lower boron levels, the proposed objective should reasonably protect the beneficial use of agricultural irrigation supply.

2. The other beneficial use potentially impacted by boron is aquatic life. The Technical Committee Report (SWRCB, 1987) indicates a level of 0.76 mg/l is protective of all aquatic life. The final version of the criteria development report (SWRCB, 1988) proposes 0.55 mg/l as protective of all aquatic life. This reach of the river, however, has the aquatic life beneficial uses of warm water aquatic life, warm water spawning, and cold and warm water migration. Examination of the data upon which these criteria were developed shows that cold water aquatic life spawning (Rainbow Trout embryo/larva) is the most sensitive life stage and species by almost a factor of 10. Considering that cold water aquatic life or cold water spawning are not beneficial uses of this reach of the river, the proposed objective should be reasonably protective of existing aquatic life beneficial uses.

3. The proposed objective is reasonably achievable with the efforts needed to meet the proposed selenium objective for this reach.

Salt Slough The proposed water quality objectives and compliance date and point are as follows:

- o 2.0 mg/l monthly mean, 1 April through 30 August.
- o 5.8 mg/l maximum.
- o Measured at Highway 165 on Salt Slough.
- o Based on weekly sampling.
- o Compliance to be achieved by October 1991.

The proposed objectives are the same as the long-term objectives recommended in the Technical Committee Report (SWRCB, 1987) with the exception of the time period limitation. The seasonal monthly mean objective is proposed to provide reasonable protection for the existing agricultural irrigation beneficial use by controlling boron levels during the period of use, i.e., the irrigation season. During the nonirrigation season, mean boron levels will be controlled by the proposed boron objective in the San Joaquin River, mouth of the Merced River to Vernalis. The above objectives are proposed for the following reasons:

1. Warm water aquatic life is more tolerant of boron than is indicated by the criterion in either SWRCB (1987) or SWRCB (1988), and the proposed objectives provide reasonable protection to instream fishery resources.

2. The crops grown in the area are boron tolerant. The monthly mean objective provides reasonable protection to the agricultural beneficial use.

3. The Regional Board will reconsider boron objectives for these water bodies in three years, when it reconsiders selenium objectives.

Mud Slough (north), and the San Joaquin River, Sack Dam to the Mouth of the Merced River The proposed water quality objectives and compliance date and point are as follows:

- o 2.0 mg/l monthly mean, 1 April through 30 August.
- o Measured at Highway 140 on Mud Slough (north).
- o Based on weekly sampling.
- o Compliance to be achieved by October 1993.

The Technical Committee Report (SWRCB, 1987) recommended a long-term monthly mean objective for the San Joaquin River, Sack Dam to the mouth of the Merced River only. The seasonal monthly mean objective is proposed to provide reasonable protection for the existing agricultural irrigation beneficial use by controlling boron levels during the period of use, i.e., the irrigation season. During the nonirrigation season, mean boron levels will be controlled by the proposed boron objective in the San Joaquin River, mouth of the Merced River to Vernalis. The proposed maximum objective is the same. The above objective is proposed for the following reasons:

1. Warm water aquatic life is more tolerant of boron than is indicated by the criterion in either SWRCB (1987) or SWRCB (1988), and the proposed objectives provide protection to instream fishery resources from peak concentrations.

2. The crops grown in the area are boron tolerant. The monthly mean objective provides reasonable protection to the agricultural beneficial use.

3. The Regional Board will reconsider boron objectives for these waters in three years, when it reconsiders selenium objectives.

Proposed Water Quality Objectives for Molybdenum

San Joaquin River, Mouth of the Merced River to Vernalis The proposed objectives and compliance date and point are as follows:

- o 10 ug/l monthly mean.
- o 50 ug/l maximum.
- o Measured at Crows Landing.
- o Based on weekly sampling.
- o Compliance to be achieved immediately upon adoption.

The proposed monthly mean objective is the same as that recommended by the Technical Committee Report (SWRCB, 1987). The proposed maximum objective is more restrictive. The above objectives are proposed for the following reasons:

1. The Technical Committee Report (SWRCB, 1987) recommended a monthly mean objective of 10 ug/l based on the criterion for agricultural irrigation supply that was developed in 1972 from a limited data base. A review by Pratt (1988) has revised the agricultural irrigation supply criterion to 50 ug/l. Thus the proposed objectives would be protective of the agricultural supply beneficial use.

2. The Technical Committee Report (SWRCB, 1987) indicates that the aquatic life criterion should be 44 ug/l as a mean. The final version of the criteria development report (SWRCB, 1988) proposes a lower concedntration, 19 ug/l as a mean, as the criterion protective of all aquatic life. The proposed monthly mean objective is considerably lower than both. The proposed objective should be protective of the aquatic life beneficial uses.

3. Monitoring indicates that the levels of molybdenum in the water bodies of concern are much lower than the published criteria. The proposed monthly mean objective is based on existing water quality and the Nondegradation Policy.

San Joaquin River, Sack Dam to Mouth of the Merced River, Salt Slough and Mud Slough (north) The proposed objective and compliance date and point are as follows:

- o 19 ug/l monthly mean.
- o 50 ug/l maximum.
- o Measured at Highway 140 on Mud Slough (north) and Highway 165 on Salt Slough.
- o Based on weekly sampling.
- o Compliance to be achieved immediately upon adoption.

The above objective is proposed for the following reasons:

1. The Technical Committee Report (SWRCB, 1987) recommended a monthly mean objective of 10 ug/l based on the criterion for agricultural irrigation supply that was developed in 1972 from a limited data base. A review by Pratt (1988) has revised the agricultural irrigation supply criterion to 50 ug/l. Thus, the proposed maximum objective would be protective of the agricultural supply beneficial use.

2. The Technical Committee Report (SWRCB, 1987) indicates that the aquatic life criterion should be 44 ug/l. The final version of the criteria development report (SWRCB, 1988) proposes a lower concentration, 19 ug/l as a mean, as the criterion protective of all aquatic life. The proposed objective should be protective of the aquatic life beneficial uses as they are based on the recommended criterion for aquatic life.

Proposed Water Quality Objectives for Salinity

No water quality objectives are proposed for the four water bodies of concern for salinity for the following reasons:

1. The salinity in the San Joaquin River is a resource management problem involving agricultural economics. The salinity in the sloughs and river is not a problem for aquatic life nor for public health. Rather it is a parameter in the agricultural economics of semi-arid areas.

2. The present salinity levels are close (slightly higher) to the objectives recommended by the Technical Committee Report.

3. Efforts required to meet proposed selenium objectives will likely reduce salinity levels.

4. The existing salinity objective at Vernalis protects the Delta.

Economic Impact of Proposed Objectives

The work of the Technical Committee included an analysis of the agricultural economy of the drainage area and an analysis of the economic impacts of several possible water quality objectives. The agricultural economy affected by and economic impacts of the proposed water quality objectives are discussed in the Technical Committee Report (SWRCB, 1987), Chapters VI and VII, respectively.

In order to evaluate economic impacts, a model of farm profitability was developed by the Technical Committee for the lands within the area contributing the majority of the agricultural subsurface drainage pollutant load to the San Joaquin River. The model estimates the gross profits (after paying for farm operating costs) generated by this drainage area. With estimates of debt burdens, the model predicts those lands which may become insolvent (no longer generate income for the farm operator) or go out of production (lands which cannot generate enough income to pay for farm operation costs) due to incremental increases in costs such as those related to the management of drainage flows. The model is summarized in the Technical Committee Report (SWRCB, 1987).

Farming in the drainage area provides an economic benefit to the cities within Merced and Fresno Counties; the counties themselves, and the State as a whole. Increased farming costs to pay for drainage control will reduce these economic benefits. The loss in benefits will be felt most directly in the west side areas of Merced and Fresno Counties and the City of Fresno. The areas most directly affected by these economic effects would be the west side cities of Mendota, Firebaugh, Los Banos and Dos Palos.

The revenues generated directly and indirectly from all farming activities in the drainage area make up about 12 percent of the total tax generated revenues to these cities. The drainage area represents 94,480 acres, or less than 7 percent of the about 1.4 million acres of farm land in the San Joaquin River Basin.

The economic impacts of the proposed objectives are primarily determined by the selenium objectives for the San Joaquin River, Mud Slough (north) and Salt Slough. The economic impacts on the agricultural community in the drainage area of implementing the proposed San Joaquin River selenium objective through drainage reduction via better water use and drainage management are relatively small--an additional cost of $16 per acre. The economic model predicts that about 1,900 acres (or 2 percent) of the land in the drainage area would become insolvent and that no lands are expected to go out of production due to these increased costs. Implementing the proposed Mud Slough (north) and Salt Slough selenium objectives would cost $21 per acre.[1/] The model predicts that 2,800 acres (3 percent) would become insolvent, but that no land would go out of production.

1/ Assumes 4% financing.

REFERENCES

1. Pratt, Parker, et. al, 1988. "Trace Element Guidelines for Irrigation Waters in the San Joaquin Valley", Department of Soil and Environmental Sciences, University of California, Riverside, for the State Water Resources Control Board.

2. State Water Resources Control Board, August 1987. "Regulation of Agricultural Drainage to the San Joaquin River", Final Report.

3. State Water Resources Control Board, 1988. "Water Quality Criteria for Selenium and Other Trace Elements for the Protection of Aquatic Life and Its Uses in the San Joaquin Valley", Final Report.

4. U.S. Environmental Protection Agency, September 1987. "Ambient Water Quality Criteria for Selenium - 1987", Office of Water Regulations and Standards, EPA-440/5-87-006.